

One Hundred Feet per Inch
Redesign of the Ball State Scale Model

An Honors Thesis (HONRS 499)

By

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Abstract

The Ball State University campus model has existed as a way-finding guide for several generations of students. Over the years, the model became outdated and the attempted updates created discontinuity and further confusion. I took on the task of devising a new model that would better communicate the layout of the Ball State campus and be more easily updated in the future. This paper will explain the history of the previous model, highlight the challenges I faced and the solutions I chose, and provide a detailed guide for future updates. I hope this information will help the next generation of our campus model makers to make the smartest decisions in updating so the model so it can continue to be a living representation of our campus.

Acknowledgements

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Thank you to Gregory Graham, my supervisor and financial supporter of the project. His flexibility and support helped me to find the best solutions.

Thank you to Lohren Deeg, my academic advisor. His method of graphic communication influenced the model and his academic expertise helped me produce this paper.

Thank you to my family and friends for their physical and emotional support in helping me to produce a model that I could take pride in.

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Preface

The Ball State University campus has experienced a notable transformation in the past decade (2006-2016). It seemed fitting that the scale model have similar renovations. The model that I updated in this project was built for display in the lobby of the Administration Building in 1993. An earlier model existed prior to that time since 1985. The more recent model was constructed by two architecture students who wanted to help other students better understand their campus. This scale model has been one of the first introductions of campus for incoming freshman for many years. The campus tour guides take groups of students through the Administration Building to show them the campus from the bird's eye perspective of the model.

I was introduced to the model during my campus visit while I was still a senior in high school. Over the years, I noted changes to the campus that went unattended on the model. I saw the Studebaker East renovations completed, the Charles W. Brown Planetarium built, and the renovation of the Johnson A and B residence halls. By my senior year in 2015, the model was not only out of date in content but also in style. I got in touch with Greg Graham, the director of Planning and Facilities Management, who had commissioned the original model. He gave me freedom to refresh and add to the campus model to reflect recent changes on campus.

Assessment of the Previous Model

The previous model (see Appendix A) was built by hand with the aid of inkjet printers to achieve the correct building scale. The scale of the model was 1"=100'. The buildings were made of several types of paper that were hand painted with white mint for standard roofs, burnt sienna for brick walls, black for windows, and charcoal gray for tin roofs (see Fig. 1). The grass was done using model turf, a green powder that provides a consistency and color similar to real landscaping. The trees were made of clippings of various shrubs and plants that had the general shape of trees at the scale (Fig. 2). Additionally, the model had several areas of landscaping and several buildings that were updated at a later date from the original construction. These areas matched neither the construction style nor the color scheme of the original model (Figs. 3,7,8). Trees and buildings were placed with contact cement and grass was placed with spray adhesive. Dimensions of the model were approximately 5' by 8'. The model was broken up into 28 sections ranging from 24" by 18" to 11.5" by 4". Each of these sections was held in place with four screws that were covered with paper circles that hid the holes of the screws and matched the landscape above (Fig. 5). The model depicted all buildings, sidewalks, and roads on campus and showed only a plain white surface for anything beyond the campus edge (Fig. 10). It existed in a custom display case with a curved Plexiglas lid that allowed for minimal visual interruption.

After assessing the original model, I made the following observations. First, the dark hues and contrast of the landscaping and the sidewalks distracted from the buildings. Second, the updated buildings and paths interrupted the flow of the model and compromised the quality and it was impossible to make any updates to the landscape without doing physical damage to the model. Third, the trees and the grass material were comprised of material components that were out of date and therefore difficult to replicate. Fourth, the partitioning of the model and the

attachment method were visually distracting. Fifth, the disconnect of the model from the city of Muncie made it appear as if Ball State existed in a vacuum and I felt that this was a misleading depiction. During the following months, I explored solutions to these problems and possibilities to enhance the model further.

Exploring New Technology

My first major inquiry was to look into the feasibility of remaking the campus buildings on a 3D printer. Inspiration for this idea came from the Chicago Model, located on the lobby floor of the Santa Fe building which is home to many notable architectural firms as well as the Chicago Architectural Foundation headquarters. The Chicago Model (Fig. 11) serves as a starting point for the CAF's walking tours and is a template for several recent topic exhibits on Chicago architecture, landscape architecture, and urban planning proposals. I was also inspired by the Indiana University-Bloomington campus model, which was designed by Midwest Studios to aid in the campus master plan discussions. This model also depicted buildings with white 3D prints and depicted landscape in cherry hardwood veneer which created a stunning visual contrast (Fig. 12).

While researching information about 3D printing, I came upon an article on the Indiana Architecture X3d project by Carol Street, who happened to be the Archivist for Architectural Records at Ball State. The article discussed her completion of a digital model of Muncie's Wysor Grand Opera House and her plans to build 3D models for Ball State's 100th anniversary in 2018. I got in touch with her and found that she had just begun to model Bracken Library and a couple other buildings on campus and was focused on achieving great detail for the architecture records. We discussed the possibility of collaborating and decided that her hope for detailed records of campus buildings would not match my timeline or goal for a simple, complete representation of campus. Her prints still inspired me to search further into the possibility of 3D printing.

A major limitation of 3D printing was the time it would take to model all the buildings in a computer-modeling program. I was able to find more than twenty of the major academic buildings and dormitories on campus already modeled in the Google SketchUp 3D warehouse¹. This was enough to make the project feasible.

I sought help from Ball State Fabrication Lab faculty to answer some questions about our 3D printers. Ball State currently owned two state of the art printers; the ZPrinter 450 and the ProJet 460 Plus, as well as a desktop model, the Makerbot Replicator 5th Generation. The two larger printers boasted the ability to print models up to 8 cubic inches in full RGB color using the binder jetting process². However, the smallest possible width of any area of wall, column, or any protrusion on the powder-based printers was 1/8". Anything smaller than that would disintegrate during the excavation process. To put this into perspective, 1/8" equated to 12' at the model

¹ Google SketchUp 3D warehouse – an online database where anyone can upload their personal building models made using SketchUp and share them for free use.

² Binder jetting process – also known as “powder bed and inkjet 3D printing” or “drop-on-powder” – a printing process that involves depositing a binding liquid and color ink on thin layers of powder to build up the model

scale. Walls with windows spaced less than 12', columns less than 12' wide, and any detail smaller than 12' would be impossible to depict on the 3D printed model. Also, sharp corners were difficult to achieve and were often chipped and blurred during excavation. The wide range of colors advertised by the manufacturer were in fact limited to a small range of lighter hues. Deep colors lightened as they were mixed with the white powder and the saturation of the ink could not be adjusted. After taking all of this into consideration, I realized that 3D printed buildings would result in a less detailed, less impressive product than the current buildings. I believe that 3D printers will one day be capable of producing highly detailed full color replicas at this scale, but for now, I chose to save the handcrafted buildings.

The other major component of the model that could be reworked was the landscape and there were some new technologies available here as well. As stated previously, I had several problems with the landscape including that it distracted from the buildings with its vibrant hues, it was impossible to update without damaging the model, and the materials were outdated. I turned to professional model makers for inspiration.

Amalgon, a company based in the UK, was a professional model making company that used CNC milling³ foam to accurately capture elevation of a landscape. A great example of this was a model of Cheddar Gorge (Fig. 13) which depicts a realistic river valley and ravine. Ball State also owned two state of the art CNC routers; the Thermwood Model 45 and the ShopSabre 23. The main benefit of CNC milling was the ability to achieve a hyper realistic landscape that could capture great detail in elevation change. The landscape could then be painted to depict sidewalks and roads. However Ball State had few elevation changes that would showcase this technology and updating the painted surface would be challenging.

Another possibility was to use laser cutting⁴ technology. The Ball State laser cutters were capable of cutting and scoring a range of materials from paper to acrylic at a degree of accuracy within a hundredth of an inch. This could potentially mimic and the hand cutting on the original model with a higher degree of accuracy than the original builders achieved. I came across another UK design company called Modelmakers LTD that had employed this strategy. Browsing the websites of other professional model companies allowed me to understand how color schemes and materials impacted the visualization of their models. It was one of the models of Modelmakers LTD, the White School Model (Fig. 14) that inspired my final style. In this model, the color scheme emphasized the 3D forms while still clearly communicating the landscape. It called attention to the detail of the structures by simplifying the detail and textures surrounding them. The laser cutter would be able to work with the materials used in this and other models so I chose laser cutting as my main means of assembly.

Construction Process

³ CNC milling - Computer Numerical Controlled milling – a computer controlled mill that uses subtractive manufacturing to produce 3D forms quickly and precisely

⁴ Laser Cutting - a non-contact cutting process that uses laser beams to cut and score materials with high precision

One of the first problems I encountered was with the scale of the model. By reusing the existing buildings, I needed to conform to the current scale of 1"=100'. At this scale, some of the peripheral campus properties north of McGalliard Ave. and west of Tillotson Ave. wouldn't fit in the display area, including the Showalter Building where I was doing the assembly. I tried several ways to reposition the area of campus depicted on the model and found no solution that could include the outer properties. I came to accept that the communicative purpose of the model was for the core of campus and those buildings and districts that impacted student life the most. The outlier properties, while an essential part of Ball State, were not essential for the success of the model.

The laser cutters presented several more problems. They could only cut vector graphics⁵ through the Adobe Illustrator program. My first challenge was to model the entire campus in Adobe Illustrator so that it would be compatible with the laser cutters. Greg gave me access to the most recent AutoCAD plan drawing of the campus, which was unfortunately out of date since 2007. Many parking lots, sidewalks, plantings, and building footprints had changed since the drawing had been completed. Also, the lines of the drawing were on more than two hundred layers.

I was able to transfer the drawing into Adobe Illustrator with the help of a tutorial. Over the course of the next month, I updated the drawing to reflect the current campus plan. I also condensed the lines into seven simple layers; roads, sidewalks, parking lines, building footprints, sports fields, bodies of water, and trees. This was a challenging process because the file was so large that only two campus computer stations were found to have the processing power. I moved my operation to the architecture library where I could update the file more smoothly.

The laser cutter had another major limitation. The print bed was 18" by 32" meaning that was the largest sheet that could fit on the bed. As mentioned earlier, the campus model was 8' long by 5' wide, which was far too large to be cut in a single pass. One of the improvements that I wanted to implement in the new model was to make fewer sections and to keep the size of each section more consistent. I divided the twenty-eight sections on the previous model into ten standardized sections within the size limits of the laser cutter. I was also able to make eight of the ten sections the same size without compromising the base of any buildings.

The drawing now contained all the necessary lines to depict the campus landscape in an organized form. My next challenge was translating that into a physical form. There were a few options for this. I could have the laser cutter score the lines onto a block of wood and then paint the roads, sidewalks, and grass each a respective color. I gave this a try and found that the paint left streaks that looked unprofessional. It was also difficult to stay between the lines at such a small scale. Another option was to do a monochrome wood base with little to no color. A quick test showed that the wood fought the style of the color buildings. Another option was to use a different colored paper to represent the sidewalks, roads, and grass on the model. This solution seemed to best complement the style of the buildings.

⁵ Vector graphics – graphics comprised of paths rather than pixels, which are understood by the computer as individual elements that can be uniquely manipulated and scaled.

I decided on a three layer format in which the roads would be the bottom layer, the sidewalks would be the second layer, and the grass would be the final layer (see Appendix D for details of this process). I picked out a gray illustration board for my base material. By turning on and off layers in Illustrator, I was able to get the laser cutters to cut or score only the lines of the layer that I wanted on a particular sheet. For the base layer, I set the laser cutter to score the lines for the roads so that I would be able to place the next layer accurately. I used a Lenox printmaking paper for the sidewalks and on this sheet I cut the lines for the roads and scored the lines for the sidewalks to guide the placement of the final layer. I chose a light green Canson colored paper for the grass and on this sheet I cut out the lines for the roads and the sidewalks.

The laser cutting method had the disadvantage of creating hundreds of tiny pieces that would have been difficult to locate on the model. I found that certain tapes could be applied to the underside of the paper so that the pieces would remain in place on the sheet until I needed to place them. However, because the materials I was cutting were so thin, it required perfect adjustment of the strength of the laser to keep it from cutting through the tape and blowing the pieces off the bed. Finding the proper strength was a matter of careful testing that I hope others will be able to avoid.

After I had cut the three layers of papers for each of the ten sections of the model, I brought them back to the office for assembly. The next step was to glue each layer down to the foam base. As I mentioned earlier, one of my goals for this project was to make the model easy to update. I did some research and found a particular spray adhesive that could produce a strong bond and be removed with little to no residue. This would allow for changes to be made to roads, sidewalks, and building footprints without compromising the integrity of the model. After testing several other glues, I found that temporary bond glue sticks produced a similar effect.

Once all ten sections of the model were landscaped, I transferred the buildings from the old model. The buildings were consistent with my color scheme and blended well with the new landscape. The buildings that had been updated with a different color scheme, however, looked even more out of place. I experimented with painting these buildings. To match the original colors, I visited several art stores with samples of the original buildings. The brick matched burnt sienna. The light gray roofs had no close relative except a spray paint for model airplanes. The other colors were common and easy to find. Once I had hand painted the updated buildings, the model looked like a cohesive whole.

At this point, there were still several buildings that needed to be built. This would prove to be one of the most time difficult parts of the project. I had access to the building plans of every building in the Showalter office so I pulled out the old drawings and started taking measurements. Then I used those measurements to draw each building elevation to scale in Adobe Illustrator, including the windows on each wall. Once I had all drawn up all the building surfaces, I cut them out using the laser cutters and then paint each piece the appropriate color. Through careful assembly with tweezers and precision contact cement, I was able to achieve a similar quality to the original model.

Once all the buildings were in place, I faced the challenge of replacing the fragile and unrealistic trees. I wanted the trees to look more vibrant than they had on the original model and I wanted them to sustain several years of static display. I searched the model stores in Muncie and found that none sold any at the 1"=100' scale or even close. This was an uncommon size. I turned to online stores and found a couple retailers who made trees at the scale but their estimated retail price neared \$1 per tree. I planned on displaying hundreds of trees on campus, so there was no way this would fit in the budget.

I turned to making my own. I researched some blogs of model making hobbyists and found that each had a different way to depict trees, yet none seemed viable at a small scale. Most methods proved to be too time consuming to make the volume I needed to make. It was on the community help pages for Spartan Games, a UK company that develops models for tabletop war games, where I found a guide for a feasible method. They used straight pins for the trunks and model shrubbery for the leaves. They could also be sturdily placed without any glue. To save time, I settled on depicting only 1,500 of the larger trees on campus and by referencing Google Earth, I was able to pinpoint a fairly accurate size and location for each tree.

There are many potential responses to the challenges and opportunities that I faced during this construction process. These are the decisions that I felt were most effective for the technology and resources that I had at hand. I hope that this information will help others understand the impact of each decision and avoid making the same mistakes.

Assessment of the New Model

The new model (Appendix C) is a combination of old and new. Each of the original problems I noted have been addressed. All buildings have been brought to a consistent style by repainting them to the original color scheme (Fig. 19). The dark, messy powder turf of the original landscaping has been replaced with three layers of paper that mimic the material of the buildings (Fig. 16). These layers provide sharp, clean transitions between sidewalks, grass, and roads that the previous model was unable to achieve. To ease in updates, each layer has been glued with a spray adhesive or a temporary glue stick that can be removed without residue. The new hand-made trees are built with straight pins and model shrubbery and are more vibrant and sturdy than the original trees (Fig. 21). Trees are pinned in the foam base without glue and buildings are glued on the top layer with dabs of contact cement. Both can be easily removed. The model is now divided into ten larger sections of approximately 18" by 28.5". There are no unnecessary screws to hold the sections in place and they can be lifted out effortlessly for updates. The model now shows roads and streets beyond the edges of campus to give a sense of the surrounding context and connectivity to the city of Muncie (Fig. 22).

Updates to the model content include changes to buildings, rework of inconsistencies, and updates to hardscape and landscape areas. The buildings updates include: renovation of the Johnson A and Johnson B residence halls, renovation of the Studebaker East hall, addition of the Charles W. Brown Planetarium, remaking of Scheumann Stadium, addition of the Briner Sports Complex, expansion of the Rinard Orchid Greenhouses, addition of the geothermal plant,

renovation of the chilling plant, and addition of the Ball Honors House. Rework of inconsistencies include: repainting of the Recreation Center, DeHority Complex, Park Hall, the Letterman Building, and several other updated buildings as well as remodeling of roads and parking lots that were damaged by updates. Updates to the hardscape include correction of the Riverside Ave. and McKinley Ave intersection, correction of medians on Riverside Ave, updates to parking along the campus drive that runs behind the Administration Building and the campus drive that runs by Woodworth Hall, corrections to parking lots throughout campus, addition of new pathways and removal of old pathways throughout campus. Changes to the landscape include the addition of the football training fields and the soccer fields along McGalliard Road.

A Flexible Model for a Changing Campus

In 2013, Ball State began working with the SmithGroup JJR to create its campus master plan. The Ball State Board of Trustees approved the master plan proposal on April 15, 2016. The master plan lays out Ball State's plans for campus development for the next 25 years. It is the first proposal of its kind in more than 20 years at Ball State. What we see in the proposal is that there are some major changes coming to campus.

Ball State is working to develop academic expansions for a new East Quadrangle, which lies east of McKinley and north and south of Riverside Ave. Following this an east campus mall project shall connect the University Village with the Jo Ann Gora Recreation and Wellness Center, and provide a car-free spine to connect pedestrians and cyclists to several destinations. University Green will be improved with an outdoor stage and CAP will undergo renovations. The plan also addresses portions of the Old Quad, including the replacement or repurposing of the Cooper Science Building. Expansions are being considered south of the L.A. Pittenger Student Center to help students engage with the Village. The so-called Cow Path, an informal name for a western campus sidewalk, will also be renovated in parallel to the new East Mall corridor. Residential Buildings across campus are receiving renovations as well. New recreation areas will be added along Bethel Avenue to improve Ball State's health and wellness image. These will include new athletic facilities such as basketball, volleyball, and aquatic centers. Parking, which has long been a complaint of students and visitors alike, is being redesigned to better meet the needs of commuters and guests.

The current timeline suggests that many of these changes will take place in the next five to fifteen years. Within three to seven years, University Green will be improved, the Worthen practice facility will be built, the Architecture Building will be renovated, Emens Auditorium will see improvements, and a new academic building will be built. The East Mall project and Cow Path renovations shall be completed during that time as well. Within five to fifteen years the new Academic Commons will be built, Bracken Library will be renovated, a residence hall will be added in the village, a second academic building will be completed, and a new parking garage will be constructed. These projects, especially the East Mall and quad renovations, will drastically change the appearance of campus on the campus model.

I have constructed the campus model to both accommodate and embrace these future changes. Each city and campus block is a separate entity on the model that can be removed and replaced as they are affected by the updates. The adhesive I used creates only a temporary bond on the grass, sidewalks, and road layers that can be lifted without leaving residue. Trees are also readily lifted and repositioned. Removing sections from the model has been made easier by omitting the screws that held each piece in place. Additionally, the update guide (Appendix D) provides a quick explanation of the materials used, where they can be found, and the steps to add or change each model element. It is essential that a campus model reflect and represent the physical changes of the actual campus. These are just a few accommodations that will ease in making those changes possible.

Conclusion

Redesigning the campus model has been both extremely challenging and rewarding. What I have described in this paper are only a few of the problems that I faced at each step of the process. However, it is incredible to realize that my work will be viewed by thousands of prospective and current students, their families, and alumni to help them understand the campus that I love.

Ball State University will never be as static as the campus scale model. It will continue to change and improve and once again the challenge will arise to make the model a true reflection of the university. I hope that future updaters will look upon my work and know that the challenge is not insurmountable. And if you happen to be one of the people who is undertaking the task, there are a few things you should know: Give yourself twice as much time as you think you need. Know that everything you was done for a reason. And remember that one inch equals one hundred feet.

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Appendix A: Previous Model



Fig. 1. Bracken Library and the Arts and Journalism Building. The buildings use a color scheme of burnt sienna for brick walls, light mint for roofs, gray for tin, and black for windows.



Fig. 2. Johnson A and Johnson B residence halls. Note the poor condition of the trees here and in other areas.



Fig. 3. DeHority Complex, Woodworth, and Park Halls. DeHority Complex and Park Hall were done in a different style during a later update. Note the color differences in the parking lot as well where changes were painted on and the patchy, blurred grass along Riverside Ave. and the nearby sidewalks.



Fig. 4. West Quad, Cooper Science, and Ball Gymnasium. Christy Woods can be seen beyond Cooper Science.

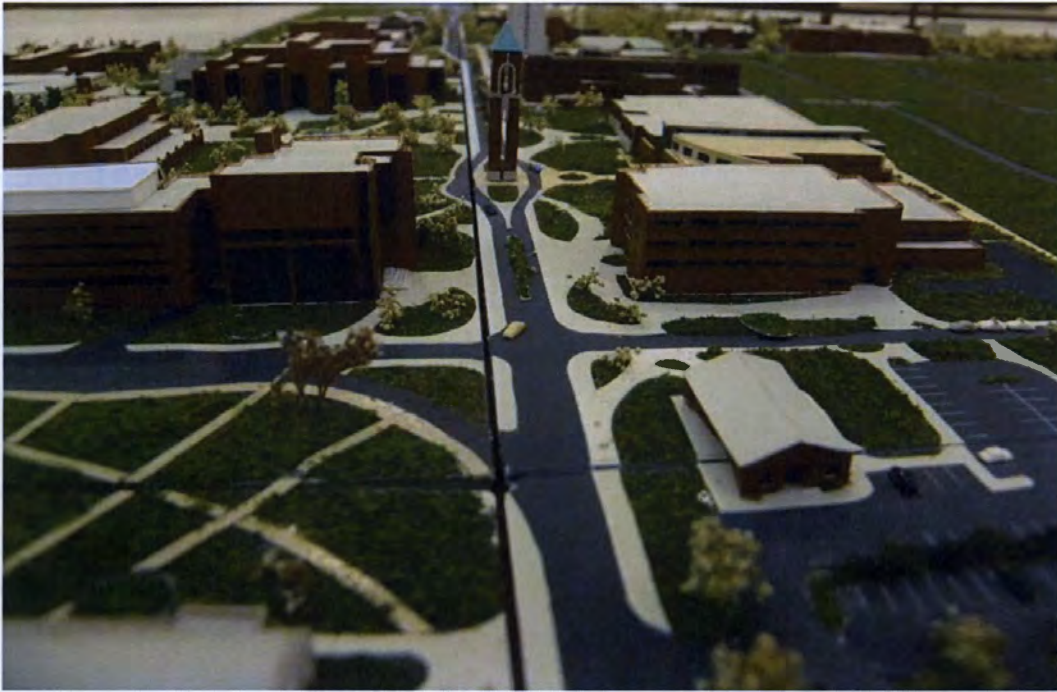


Fig. 5. The Architecture Building and the Robert Bell building. Note the visible gap where the sections come together. Also note the floating circles that are covering the screws.



Fig. 6. Emens Auditorium and the Hargreaves Music Building. Note how the sections come together along Riverside Ave. and McKinkley Ave.

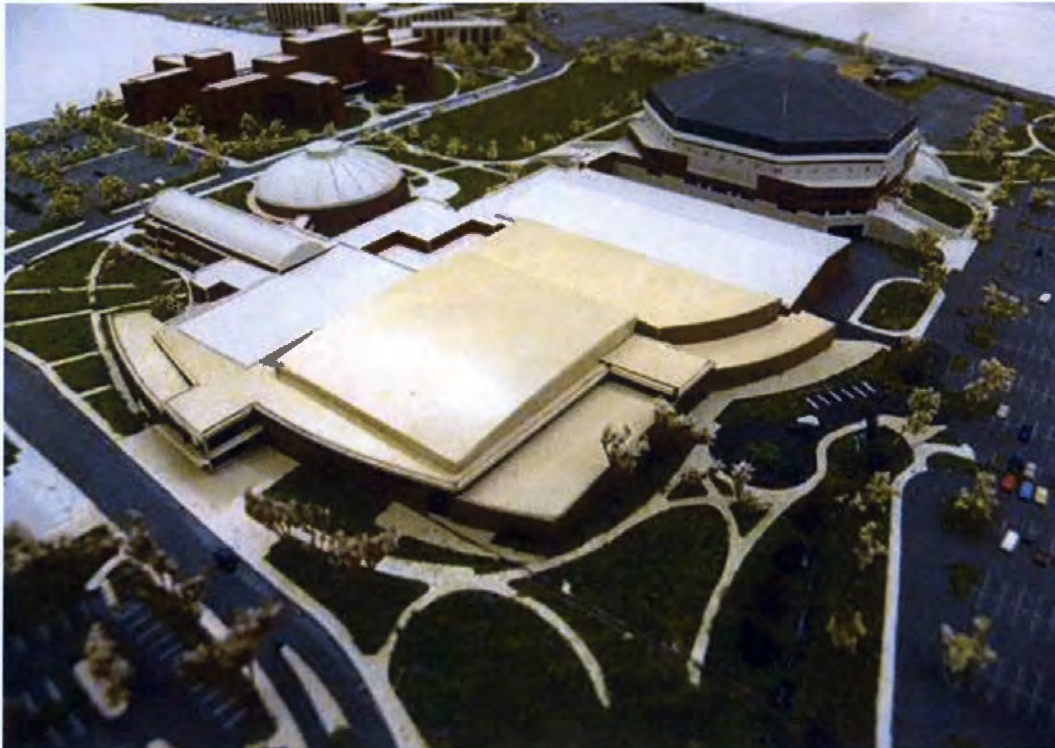


Fig. 7. The Jo Ann Gora Recreation and Student Wellness Facility. This is another example of inconsistency during the update. New sidewalks were patched in pieces in a different color, parking lot changes were painted on, and the building was done in different colors.



Fig. 8. A main section of campus.



Fig. 9. Scheumann Stadium and Alumni Center. The sections of the model cut through the center of the stadium causing the visible division in the colonnade and the peeling of the football field. Due to the isolated location and color differences, Scheumann Stadium looked like it didn't belong on the model.

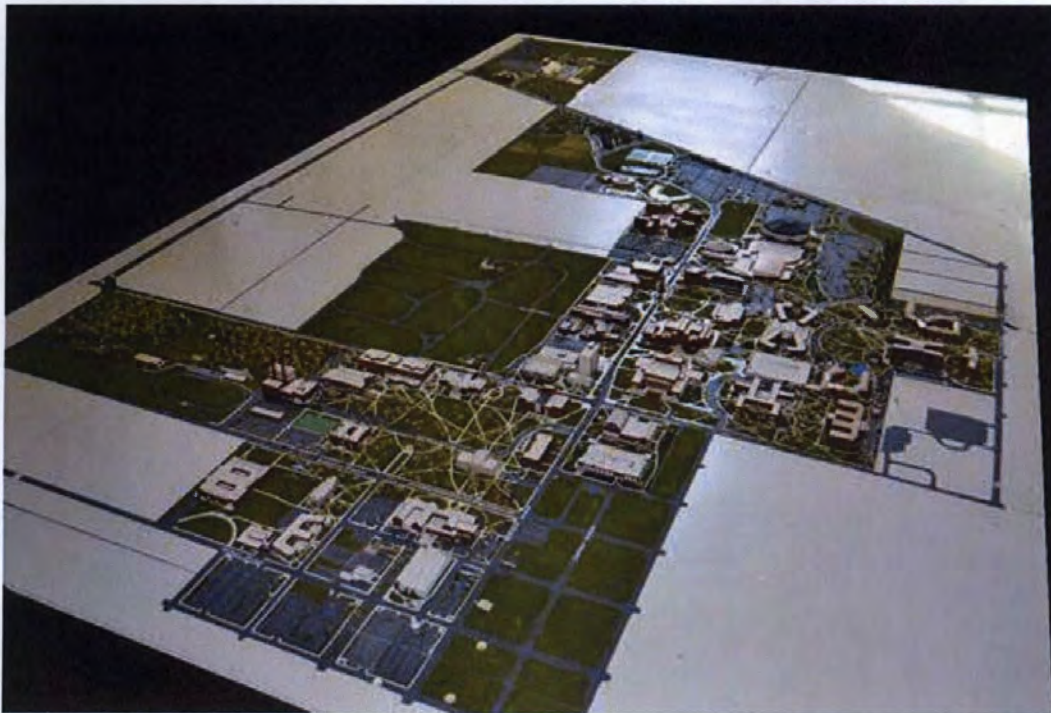


Fig. 10. The entirety of the 8' by 5' model. Note how roads and sidewalks cut off at the edge of campus and become white space. Not divisions for the 28 sections of the campus model.

Appendix B: Precedents



Fig. 11. The Chicago Model, a 320 square foot model funded by the Chicago Architecture Foundation. It depicts over 1,000 3D printed buildings and is updated annually to reflect the current city.

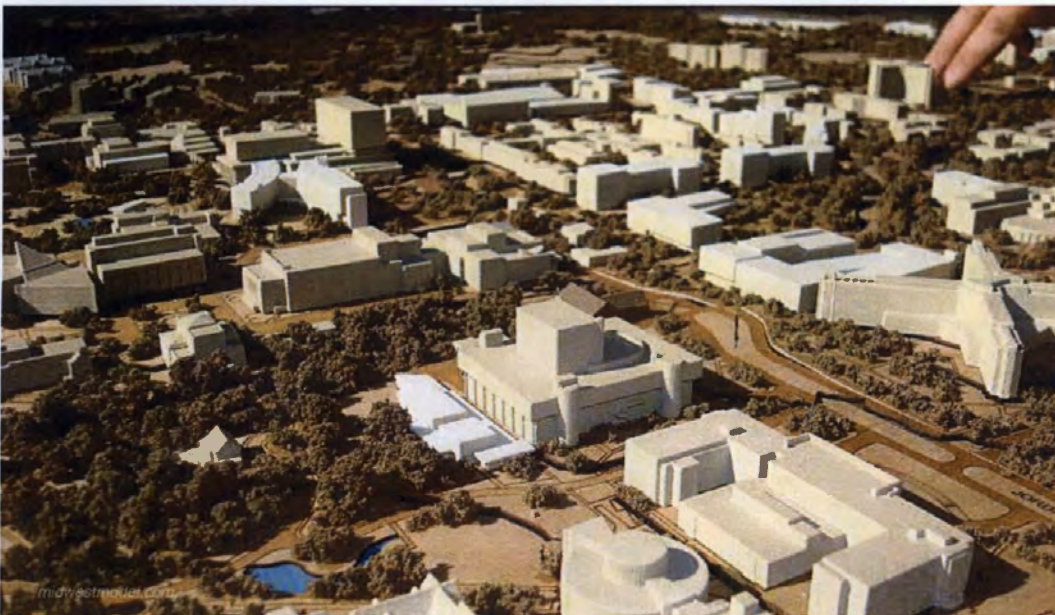


Fig. 12. The Indiana University Campus Master Plan by Midwest Studios. This model uses white 3D printed buildings at the 1"=145'. The look is clean, but minimal building detail can be depicted



Fig. 13. Cheddar Gorge Cable Car Model by Amalgam. This model uses CNC technology to achieve realistic landscape.



Fig. 14. The White Scale Model designed and constructed by Modelmakers LTD. This model largely inspired my design.

Appendix C: New Model



Fig. 15. Teacher's College and Emens Auditorium.



Fig. 16. The new Scheumann Stadium. Note the color consistency and lack of division. Compare to Fig. 9.

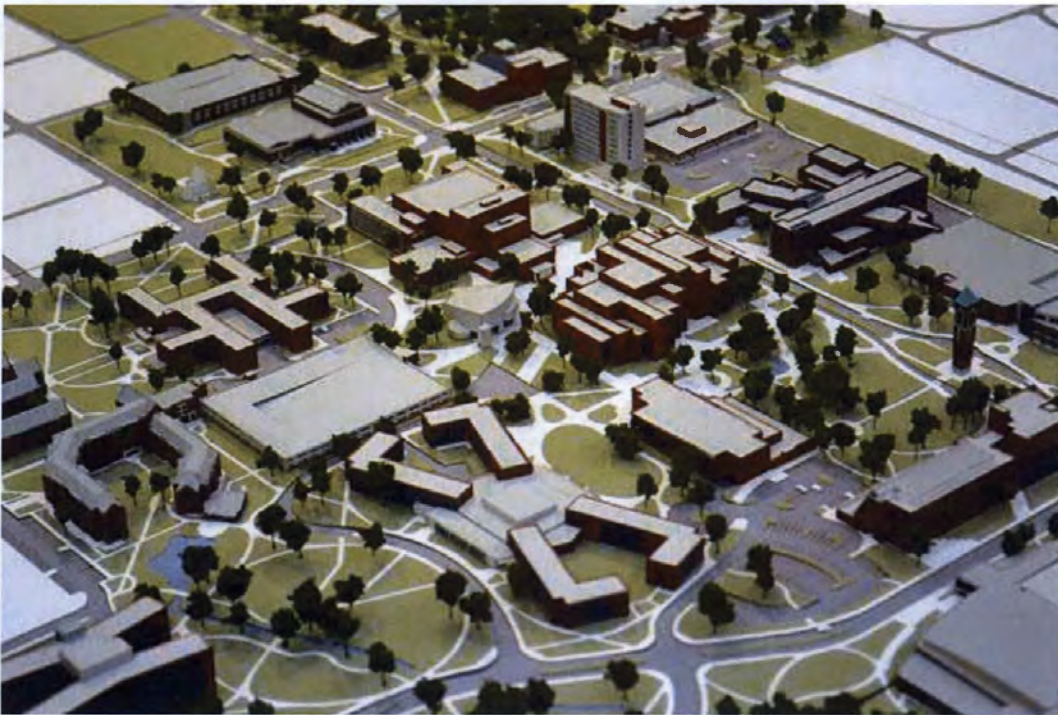


Fig. 17. The main section of campus. Compare to Fig. 8

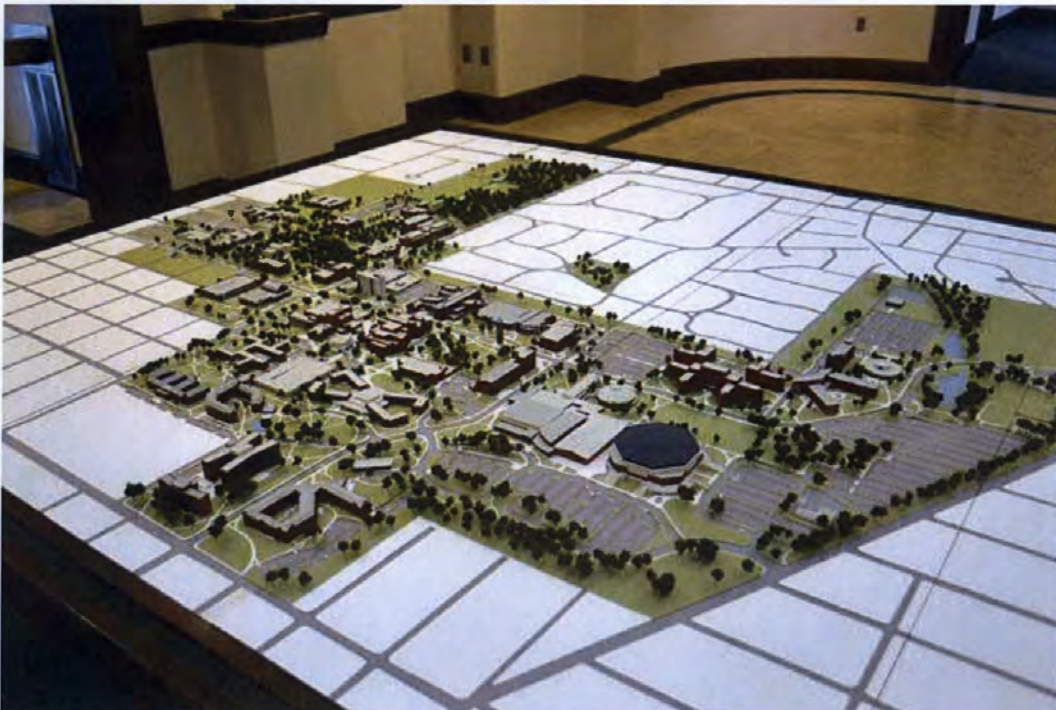


Fig. 18. A bird's eye perspective of the new model in display location.

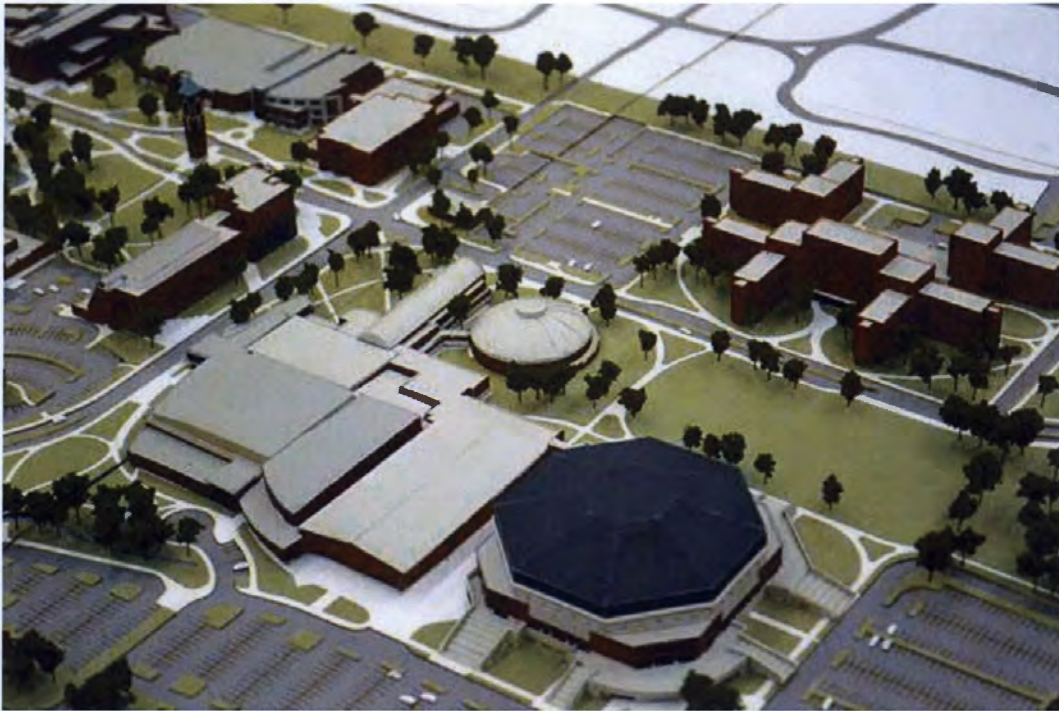


Fig. 19. The Jo Ann Gora Recreation and Student Wellness Facility. Buildings have been brought to a consistent style and the parking lot has been repaired. Compare to Fig. 7.



Fig. 20. Campus south of Riverside Ave also depicting Christy Woods. Compare to Fig. 4.



Fig. 21. The renovated Johnson A and Johnson B residence halls. Compare to Fig. 2.

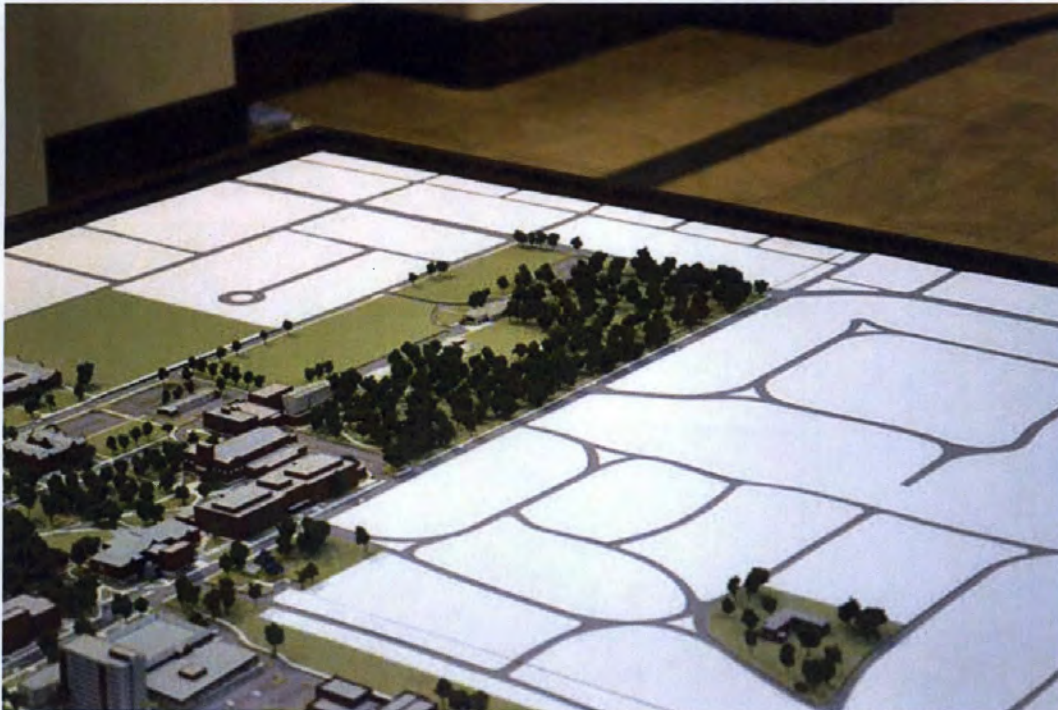


Fig. 22. The Bracken House and Christy Woods.



Fig. 23. (Before) The repainted Kinghorn Hall



Fig. 24. The new model in display location.

Appendix D: Guide to Update the Model

TREES

1. For the trunks, I used straight pins size 20 or smaller from Hobby Lobby, Michael's or Walmart.



2. Apply 2-3 coats of spray paint to the pins to mimic bark color. I used Krylon Cinnamon color enamel paint from Hobby Lobby



3. Unfortunately, the pins are too long at full length and poke through the bottom of the model. Use a pair of pliers or wire cutters to snip them to approximately $\frac{3}{4}$ inch.



4. Coat the ball of the pin in a thick glue. I used Goop brand glue.



5. For the leaves of the tree, I use Woodland Scenics brand Light Green Underbrush. Grab a pinch of the material in hand and press onto the glue covered ball of the pin until it is covered and resembles a scale tree. Allow to dry.

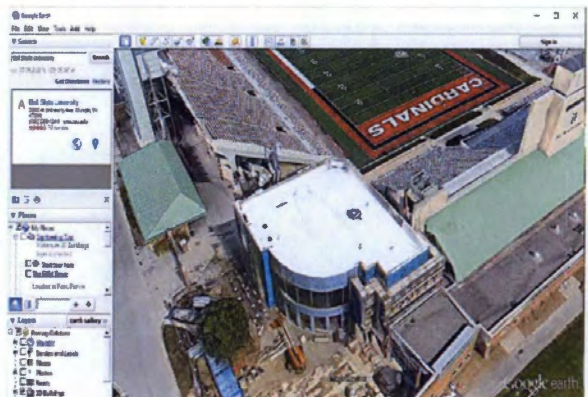


6. No glue is necessary to place the pins into the model. Simply grab them by the stem with a tweezer or a pair of pliers and press them into the model surface. Adjust to desired height keeping in mind that 1"=100'.

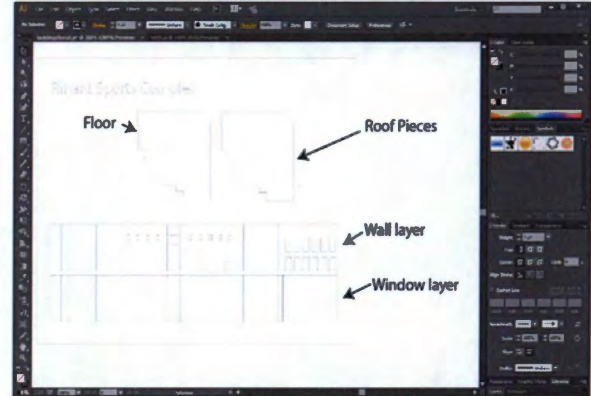


BUILDINGS

1. Find building plans and elevations at the Planning and Facilities Office. Access Google Earth to see 3D imagery and better understand the building.



2. Using the building plans and elevations, draw the roof, floor, and walls of each building in Adobe Illustrator at 1"=100' scale, including the windows for each wall. Make a duplicate of the wall layer without the windows to serve as a window layer.



3. Apply Frog Tape for Delicate Surfaces or a similar tape onto the back of the paper to be cut. I used 80 lb white Canford paper for the buildings in my update.



4. Use the appropriate laser cutter settings to cut the material without damaging the tape. For my 80lb Canford paper, I set the cuts to 10% power, 15% speed, and 500 dpi. For lines that I wished to score, I used 1% power, 15% speed, and 500 dpi.



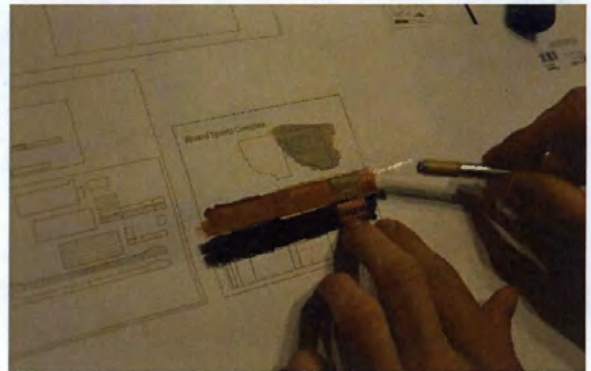
5. Paint each section of the building cut. For the roof layer, I use Testors Spray Enamel in the color Flat Light Aircraft Gray. For walls I used, Liquitex Burnt Sienna spray paint. For the window layer I used black acrylic. For the tin roofs, I used charcoal gray.



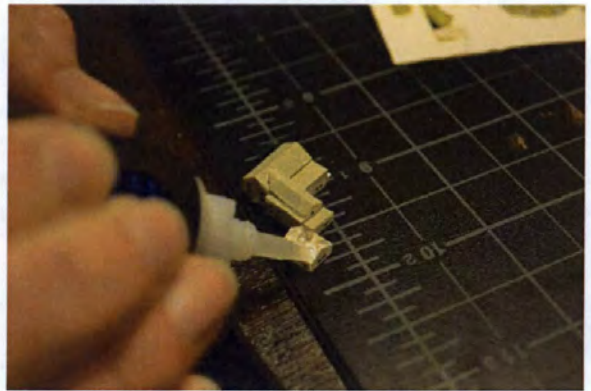
6. If using spray paints, you can spray them into a container and paint them on with a brush. For windows that are very small, you may wish to score the lines on the laser cutter and fill them in with a black pen.



7. Peel up the wall layer with a precision knife and glue the pieces on top of the window layer to finish the walls with windows.



8. Assemble the buildings by placing down the floor and peeling the walls from the sheet one by one. Glue the bottom portion of the wall and press it against the correct side of the floor piece. Once two sides meet, glue them together. Add the roof once all walls are in place. Reference Google Earth to visualize how the building needs to look. I use this glue

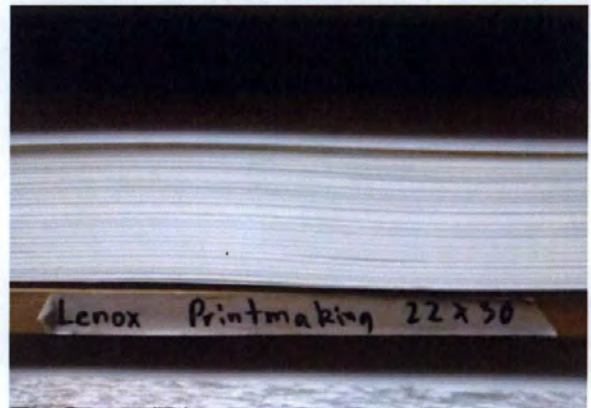
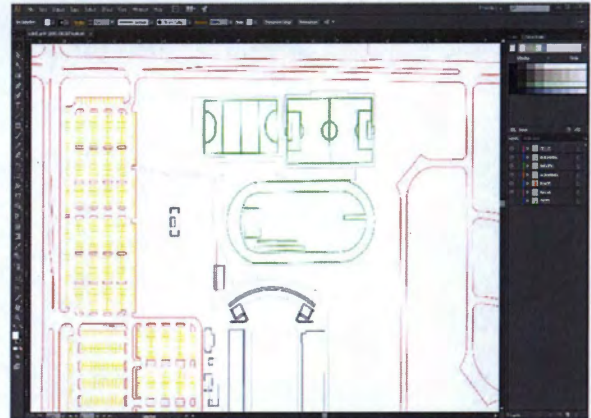


9. Place the new buildings down on the model with a small dab of contact cement.



GRASS, SIDEWALKS, ROADS

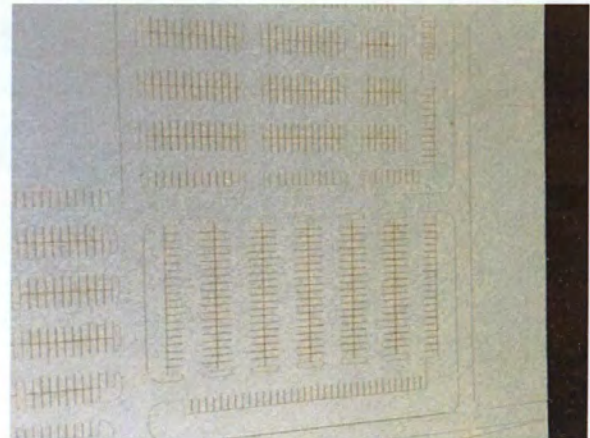
1. Locate the pieces that need to be updated on the Adobe Illustrator campus plan file. Copy these pieces to another sheet and arrange them to maximize the space of the sheet.
2. Purchase the necessary materials for the layer that will be updated. For the road sheet, I used Crescent Board Light Grey #1000 Illustration board available at Art Mart.
3. For the sidewalk sheet, I used the 22" by 30" Lenox Printmaking paper available at Art Mart.
4. For the grass sheet, I used the 19" by 25" Canson Mi-Teintes Light Green paper also available at Art Mart.



5. If updating the sidewalk or the grass sheet, cover the back of the sheet with Frog Tape for delicate surfaces or a similar tape. Adjust the lasers to the settings shown on the chart to prevent cutting through the tape.

	Power	Speed	DPI
Road Layer			
(Scores)	10	10	500
(Cuts)	45	10	500
Sidewalk Layer			
(Scores)	1	10	500
(Cuts)	11	13	500
Grass Layer			
(Scores)	3	15	500
(Cuts)	9	15	500

6. For the road sheet, score the lines of the Roads, Water, and Parking layers and turn off all other layers.



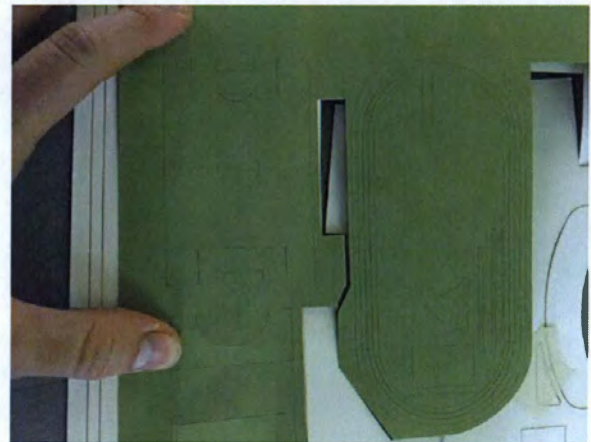
7. For the sidewalk sheet, cut the lines of the Road and Water layer and score the lines of the Sidewalks layer. Turn off all other layers.



8. For the grass sheet, cut the lines of the Sidewalks, Roads, Water, and Buildings layers, and score the lines of the Fields layer. Turn off all other layers.



9. To assemble the landscape, start by removing the trees and buildings, then peel up the out of date portions of the model.



10. Place the sidewalk pieces down first and then the grass on top. Use spray adhesive or glue stick on the back side of the material before putting in place. Use the score lines on the sheets to guide placement. Replace trees and buildings to complete.

